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Compact research satellite to test new technologies

by John Brownlee, Space Vehicles Directorate

KIRTLAND AFB, N.M. — If you have watched morning cartoons anytime in the last 45 years, you probably know that the lyric, "Here I come to save the day," means that enduring children's superhero Mighty Mouse "is on the way!"

But today a caped TV crusader wasn't the only small but mighty object headed skyward on an important assignment.

Launched this morning (Wednesday, July 19, 2000) aboard a Minotaur II from Vandenberg AFB, Calif., the latest Air Force Research Laboratory satellite experiment, dubbed MightySat II.1, embarked on a one-year mission not to fight injustice but to demonstrate how well several new space technologies will perform.

GETTING THE JOB DONE — Lab specialists work dilligently on technology for the MightSat II.1 The satellite embarked on a one-year mission to test several new space technologies recently.

According to MightySat program manager Randy Kahn of AFRL's Space Vehicles Directorate, "The 266-pound MightySat II.1 is a relatively low-cost satellite about the size of a small refrigerator and the second of its kind built and tested here at Kirtland AFB. Built by the Spectrum Astro Corporation under contract to AFRL, it will fly a number of advanced technology experiments that are not only critical to the future of spacecraft subsystems, but eventually, to the warfighter. Our highly successful MightySat I, launched from the cargo bay of the Space Shuttle *Endeavour* on December 14, 1998, demonstrated five other forward-looking experiments that have improved our operational understanding of how new technologies actually work in space. We expect MightySat II.1 will do the same."

MightySat II.1's primary payload is a Fourier Transform Hyperspectral Imager (FTHSI), which will help the warfighter "see" more details on the ground and thus enable better planning and tactical decisions.

"Another onboard experiment is a solar array concentrator that increases the amount of energy solar cells convert into spacecraft power — at half the cost and weight," Kahn said. "The array also reduces the number of solar cells needed to produce the same amount of power — and less weight means lower launch costs — always an important consideration in a business that spends tens of thousands of dollars for every pound placed in orbit," he said.

AFRL's suite of experiments is also investigating the viability of a new device called a shaped memory alloy thermo-elastic tailoring experiment that may some day replace mechanically complex actuator mechanisms that previously have caused spacecraft failures because of their improper operation.

"To do this, we are using a heat-actuated, shaped-memory metal alloy on MightySat II.1 that will gently control the shape of certain spacecraft composite materials as needed," Kahn said.

Also onboard is the high-speed Quad-C40 microprocessor that will not only process data collected by MightySat II.1's hyperspectral imager, but increase the number of collected images that can be downlinked to a ground control station.

Additional MightySat II.1 experiments include a multi-functional composite "bus" structure that will demonstrate the merits of spacecraft modularity and flexibility and help AFRL researchers better understand how well integrated

systems such as thermal management and bus structures can work together. Multifunctional structures such as these reduce system complexity, volume, and weight — all crucial considerations when seeking to lower spacecraft production and launch costs.

The laboratory is providing a ride aboard MightySat II.1 for the Naval Research Laboratory's Miniature Space Ground Link System experiment that will test a small transponder approximately 70 percent smaller and lighter than used today.

MightySat II.1's health and the status of its experiments will be monitored by an Air Force Space and Missile Systems Center (SMC) team here that will receive telemetry, capture moment-by-moment data, and inform AFRL scientists responsible for the on-board experiments ell subsystems are performing.

Costing $36.4 million, MightySat II is a joint Defense Department Space Test Program and AFRL mission and is the second in a planned series of highly sophisticated Air Force demonstrations. Scientists and engineers are using them to quickly integrate diverse, cutting-edge space technologies developed in the laboratory and expedite their transition into actual satellites beneficial to warfighters.

"It is a privilege to help AFRL with the challenges involved getting these important experiments into space," said SMC's MightySat II.1 Space Test Program Mission Manager Captain Mark Mocio. "Coupling the Space Test Program's launch and on-orbit operations expertise with AFRL's impressive space vehicle experience creates a very capable and successful team." **@**